

Aerosol-Cloud-SO₂ Working Group

Summary

AURA Data Validation Meeting

**CSC, Greenbelt, Maryland
September 21-23, 2005**

Updates on EOS MLS Cloud Algorithms and Scientific Investigations

Dong L. Wu and Jonathan H. Jiang

Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California

Outline:

- Evaluations of MLS v1.5 IWC and plans for v2.0 cloud products
- Thoughts on improving IWC accuracy with A-Train measurements
- MLS sciences for better understanding pollution-cloud-precipitation processes

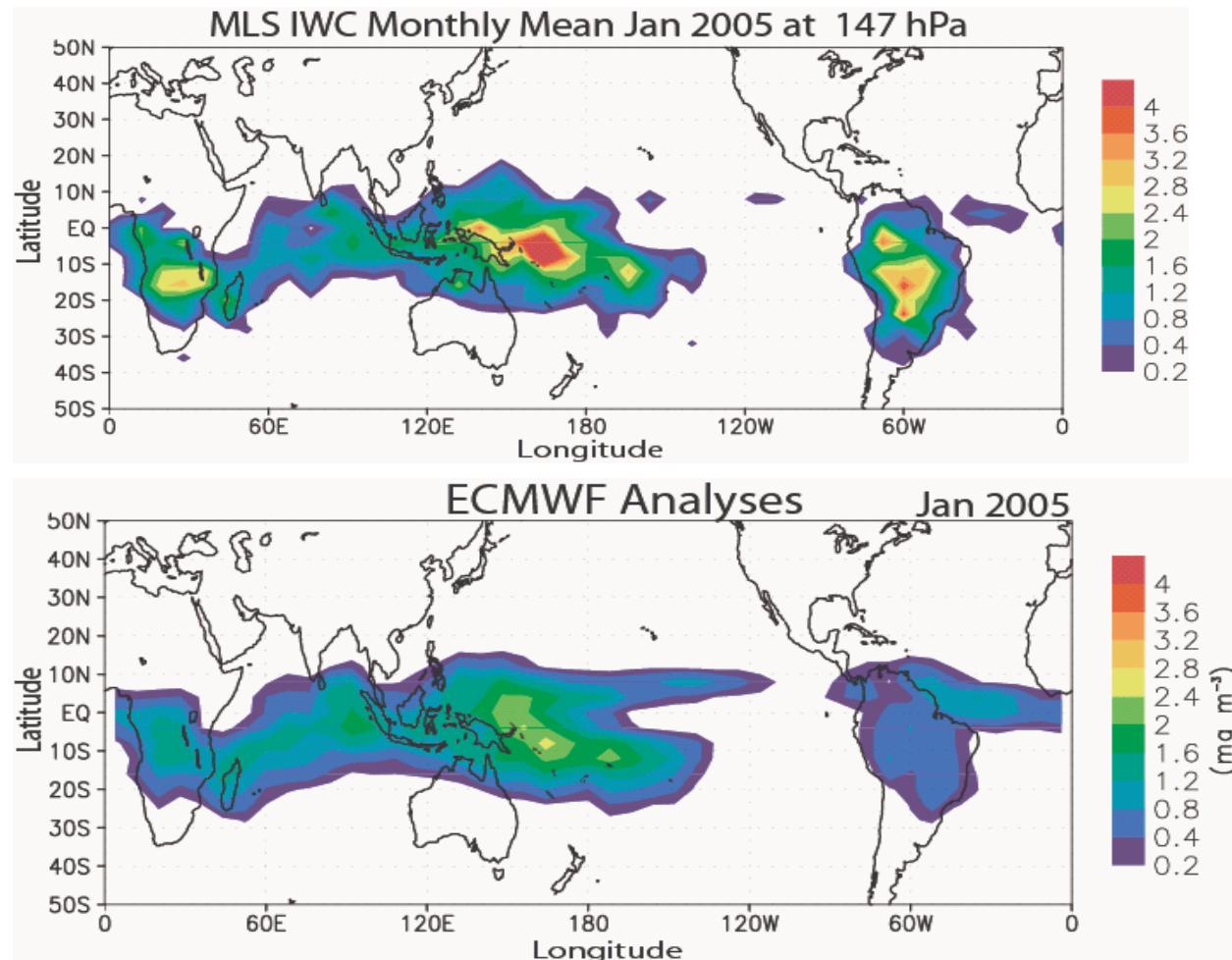
Status of MLS v1.5 IWC

- 1 year of observations (95% processed)
- Files available in IDL save format
ftp://mls.jpl.nasa.gov/jonathan//mls_cld/V1.5CLD02/
or email questions to Jonathan.H.Jiang@jpl.nasa.gov
- Caveats on MLS IWC:
 - Average over ~200x7x3 km³
 - Dynamic range: ~2 – ~80 mg/m³
 - Pressure range: < 215 hPa
- IWC > ~50 mg/m³ likely to be underestimated due to saturation
- Initial comparisons with IWC generated by 5 GCMs encouraging (see Li et al. GRL)
- Climatology and seasonal variations of MLS IWC

MLS vs ECMWF: January 2005

Li et al. 2005

MLS



ECMWF

Monthly Mean - MLS values are generally about 2 times larger than ECMWF.

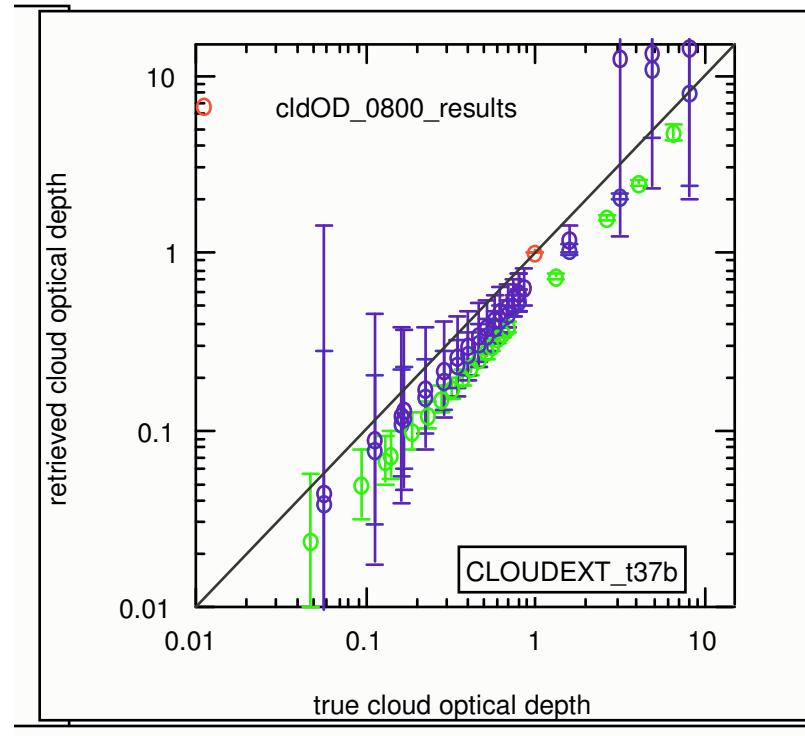
TES effective CTP and OD: Simulations and Comparisons to MODIS and AIRS

A. Eldering and the TES team

September 2005

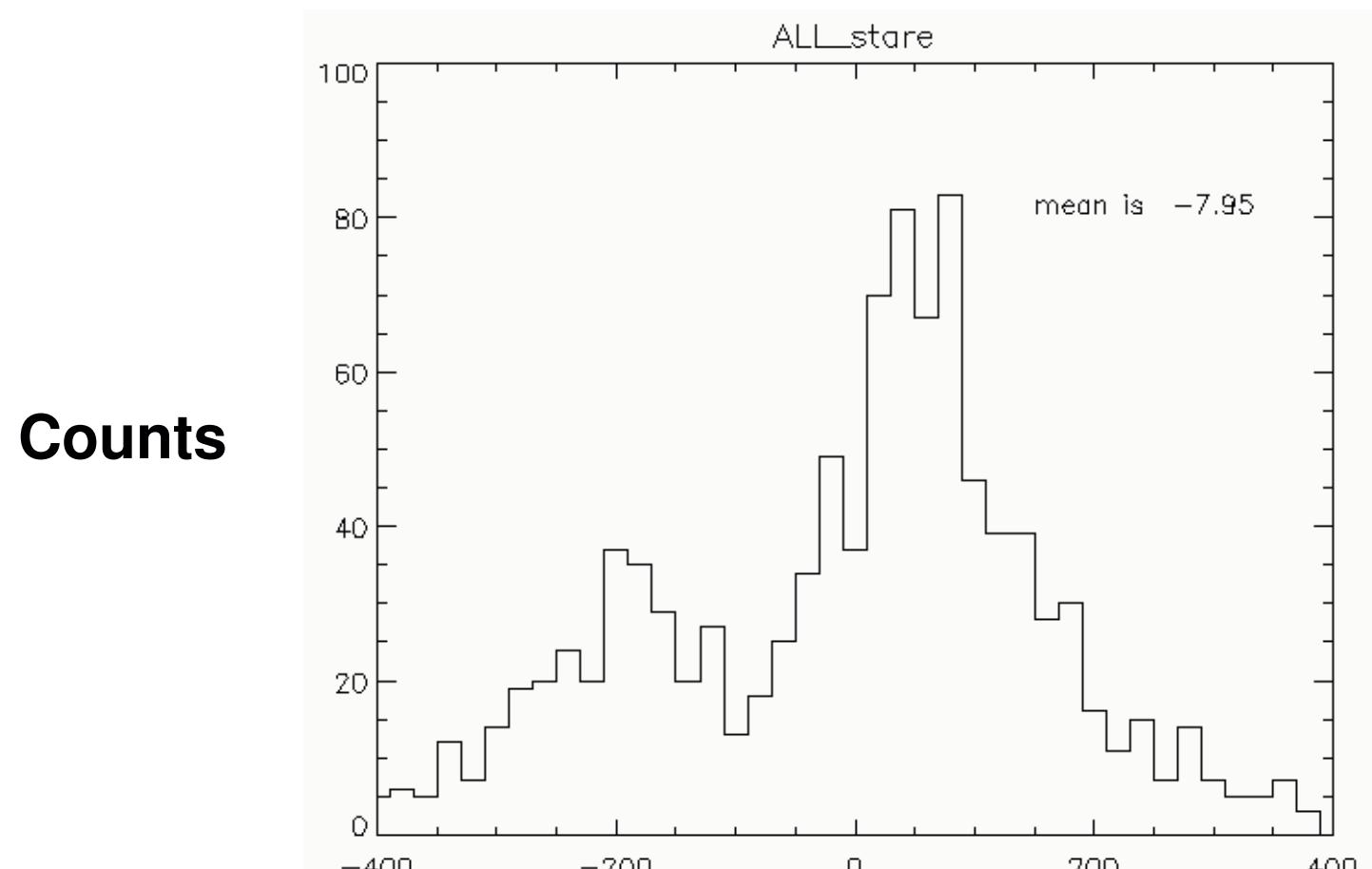
Retrieval Simulations

**Retrieved
Cloud
Optical
Depth**



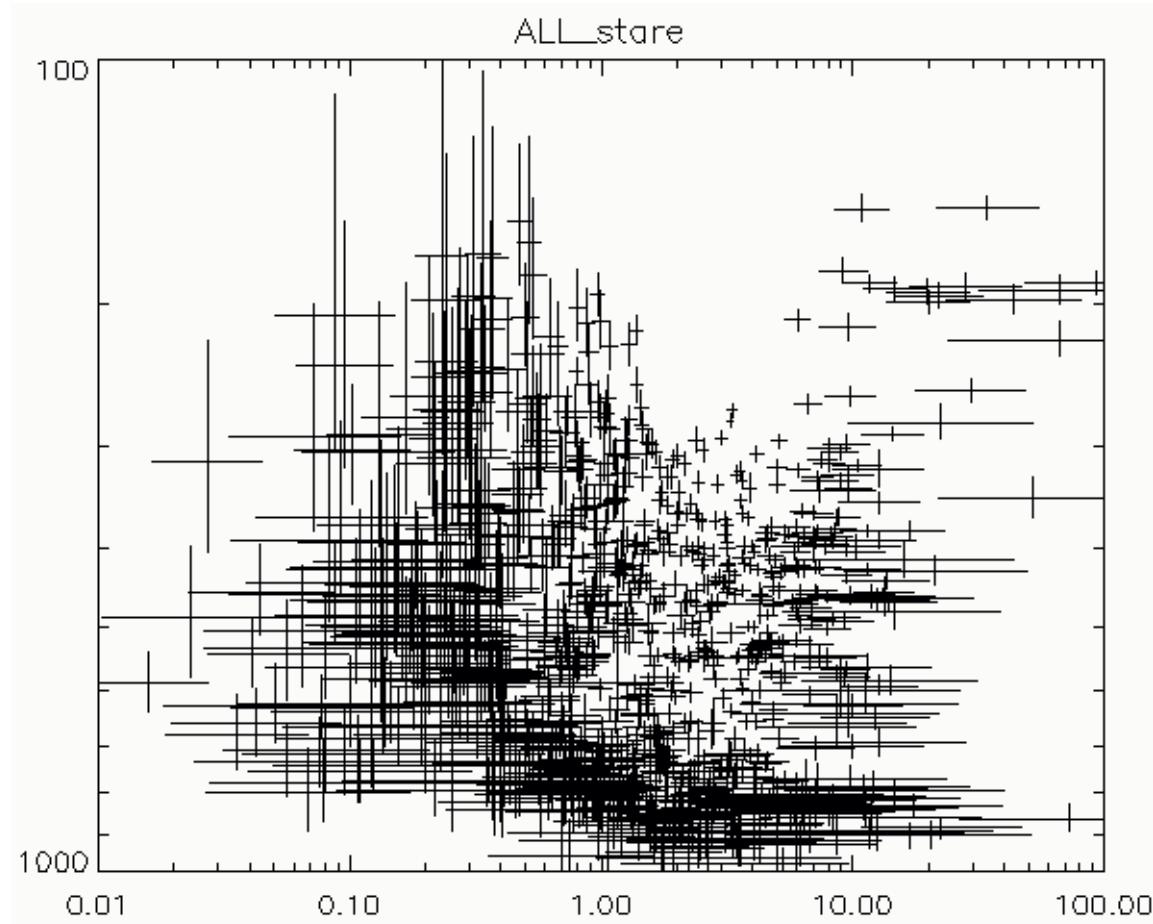
True Cloud Optical Depth

TES-MODIS CTP stats



Estimated errors for TES

**Cloud
Top
Pressure**



Cloud Optical Depth at 975 cm⁻¹

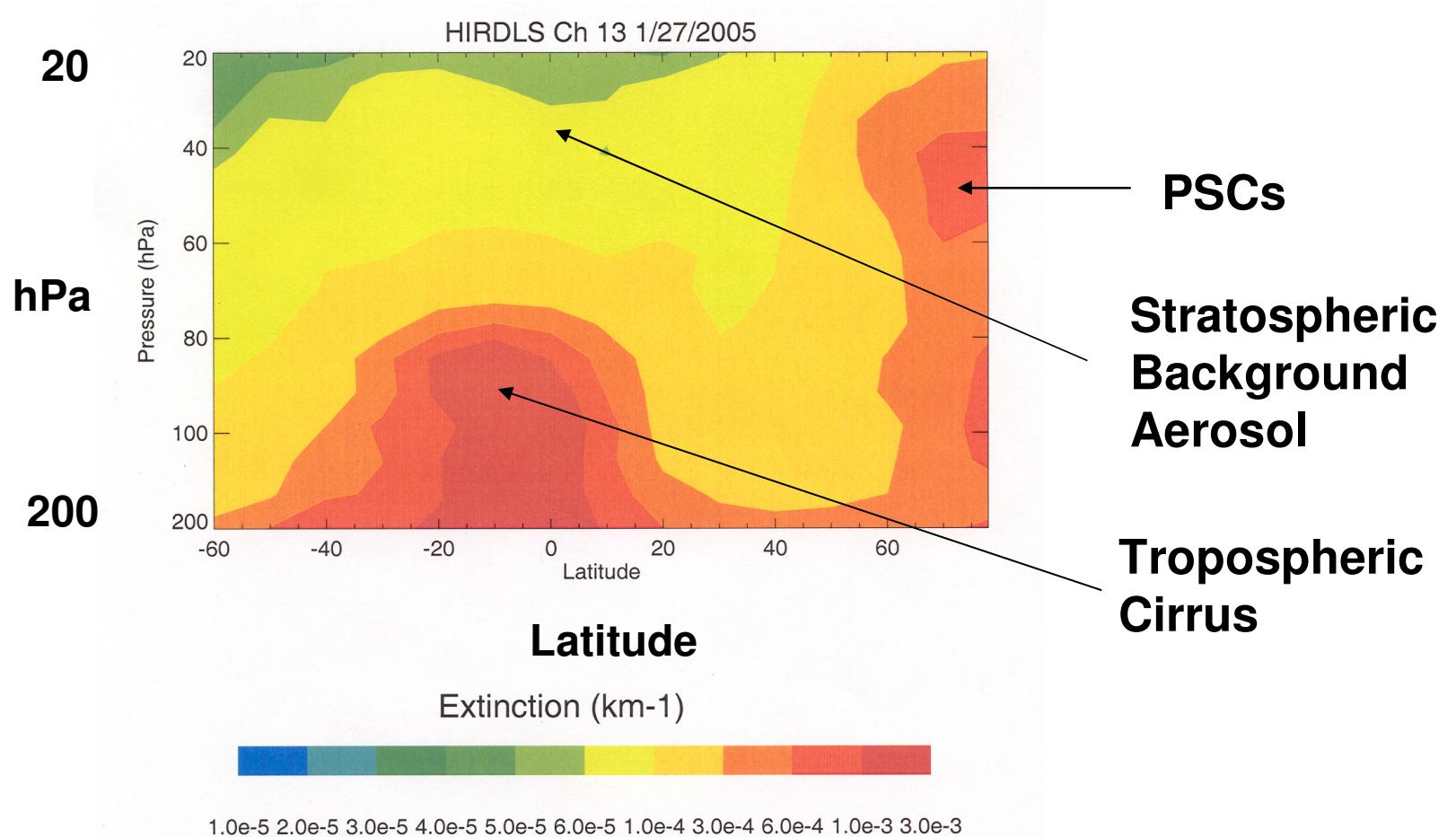


Validation of HIRDLS observations of tropospheric cirrus and Polar Stratospheric Clouds

**Steven T Massie
NCAR, Boulder, Colorado**

**AURA Validation Meeting
Goddard Space Flight Center
September 21-23, 2005**

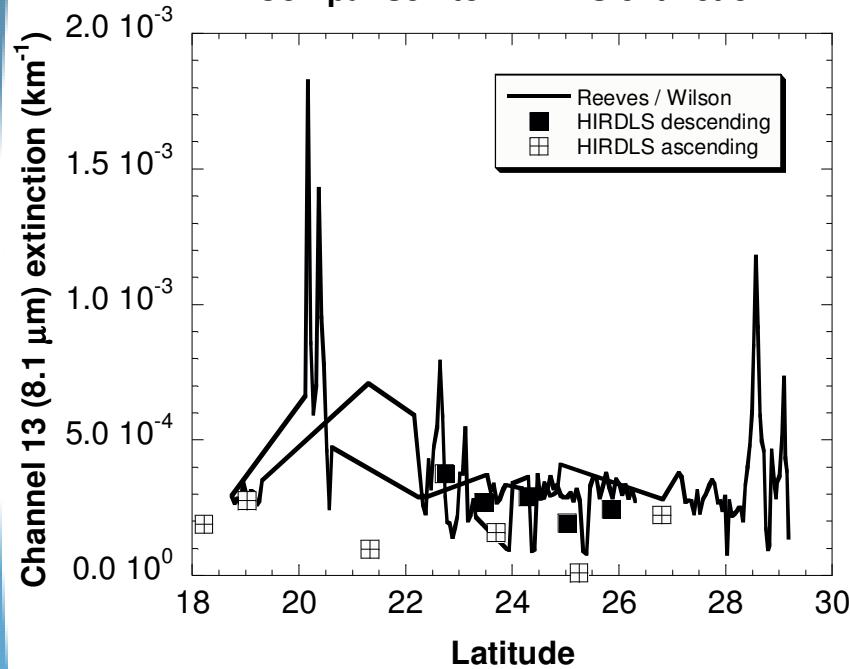
One Day's Retrieval 1/27/05



Aerosol Extinction Validation

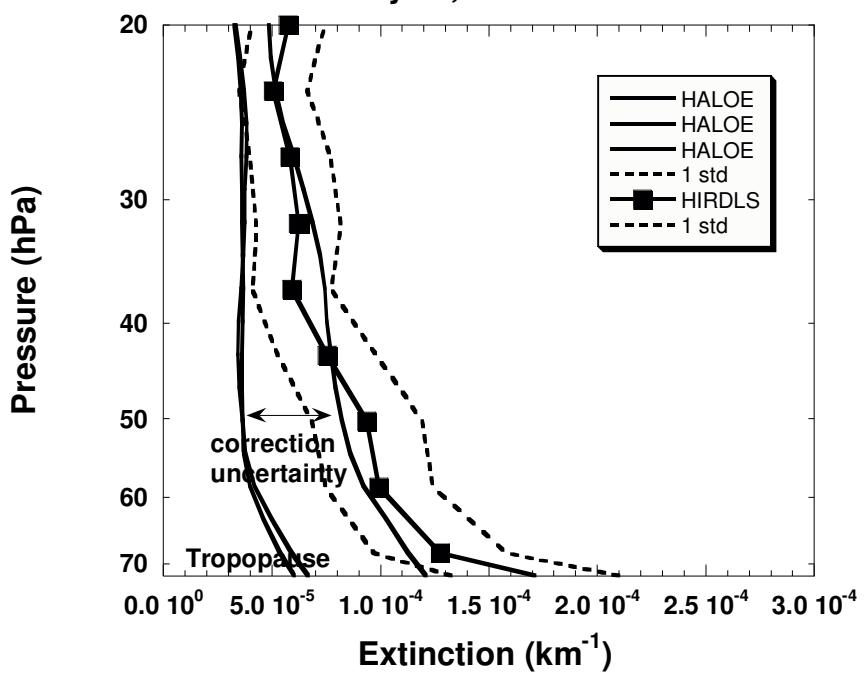


June 19 WB-57 Flight
Reeves / Wilson (DU) aerosol size distributions
Comparison to HIRDLS extinction

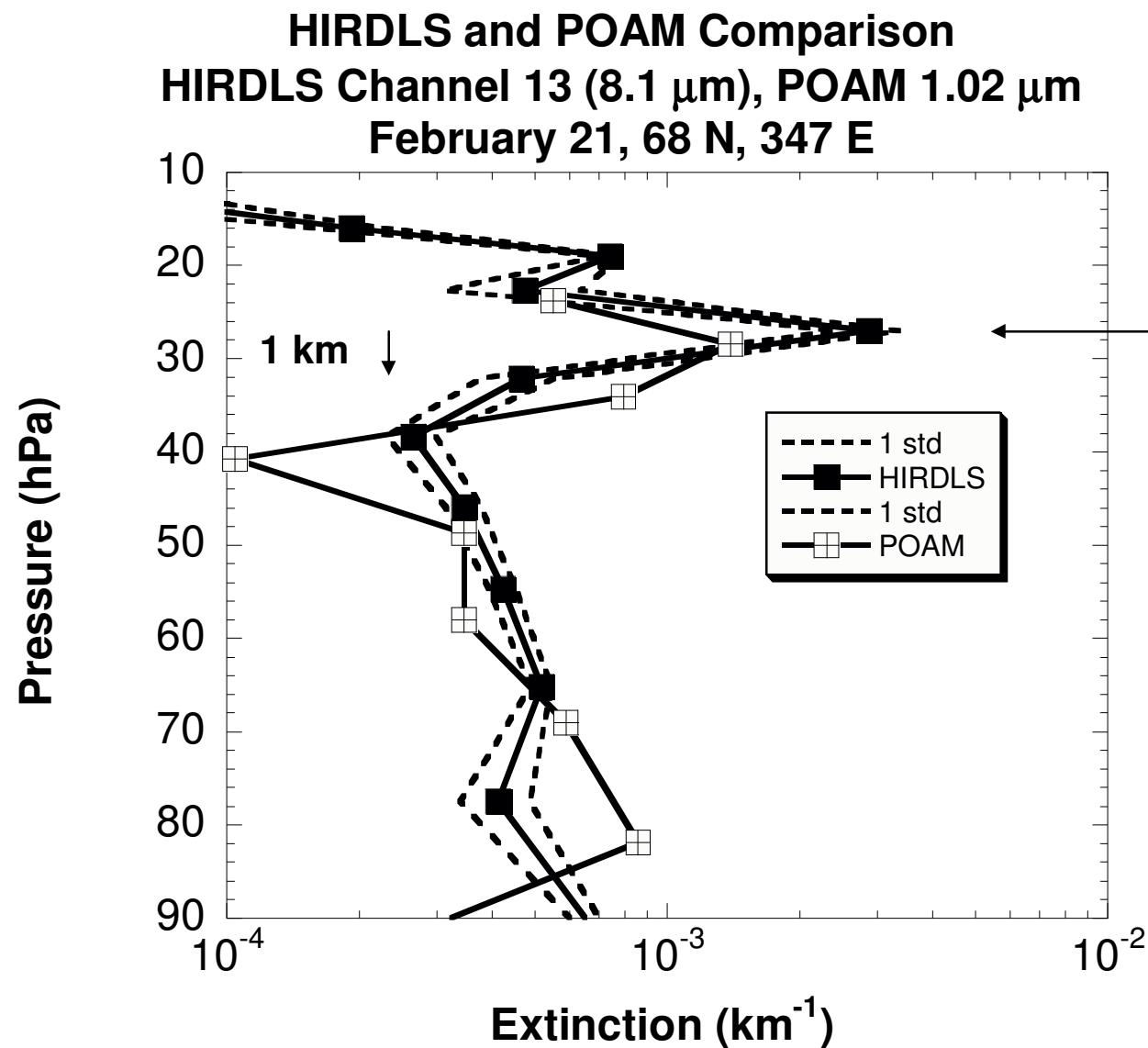


Tropopause Region

Comparison of HIRDLS and HALOE extinction
HALOE data scaled to HIRDLS channel 13 wavelength
January 27, 2005 10-15 N



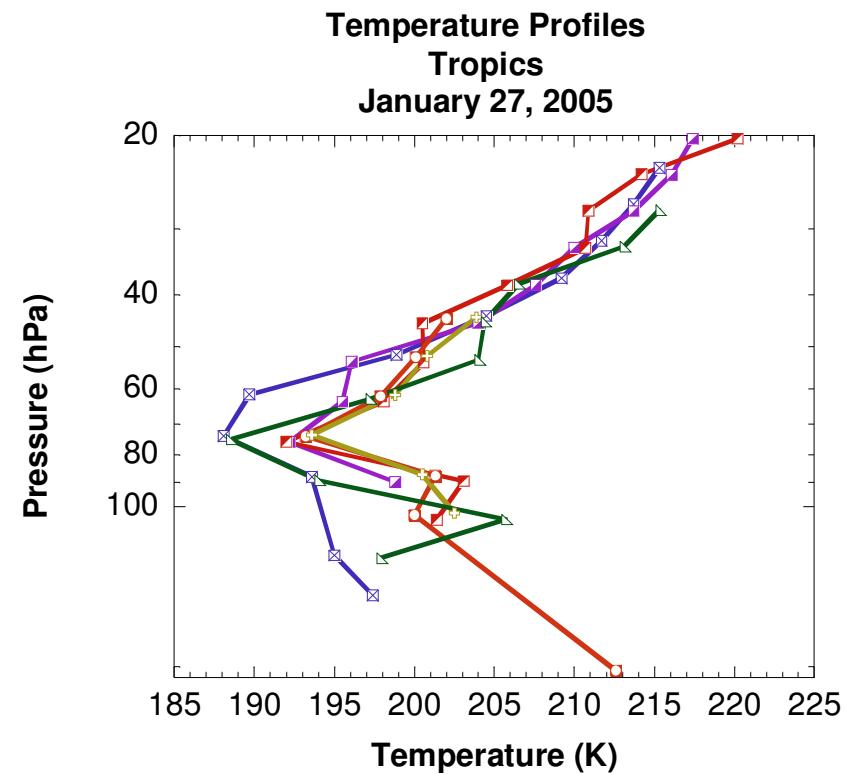
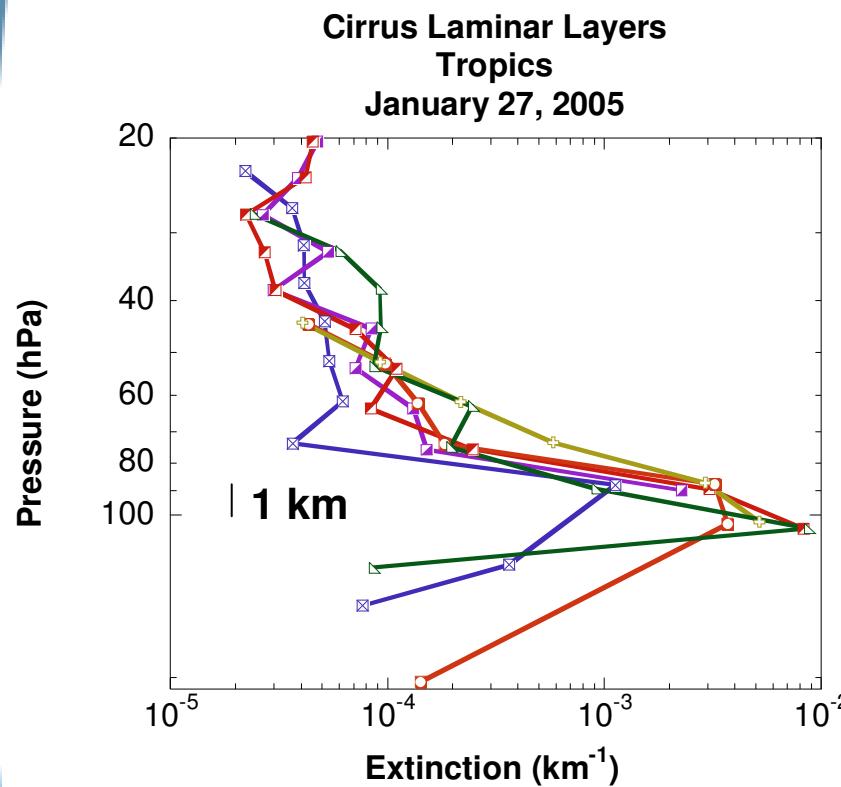
Stratospheric Background

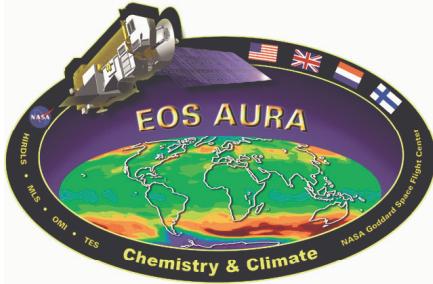


averaged
4 HIRDLS
profiles

distance
between obs
 $< 200 \text{ km}$

Subvisual Cirrus Clouds Involved in UT/LS Dehydration Processes



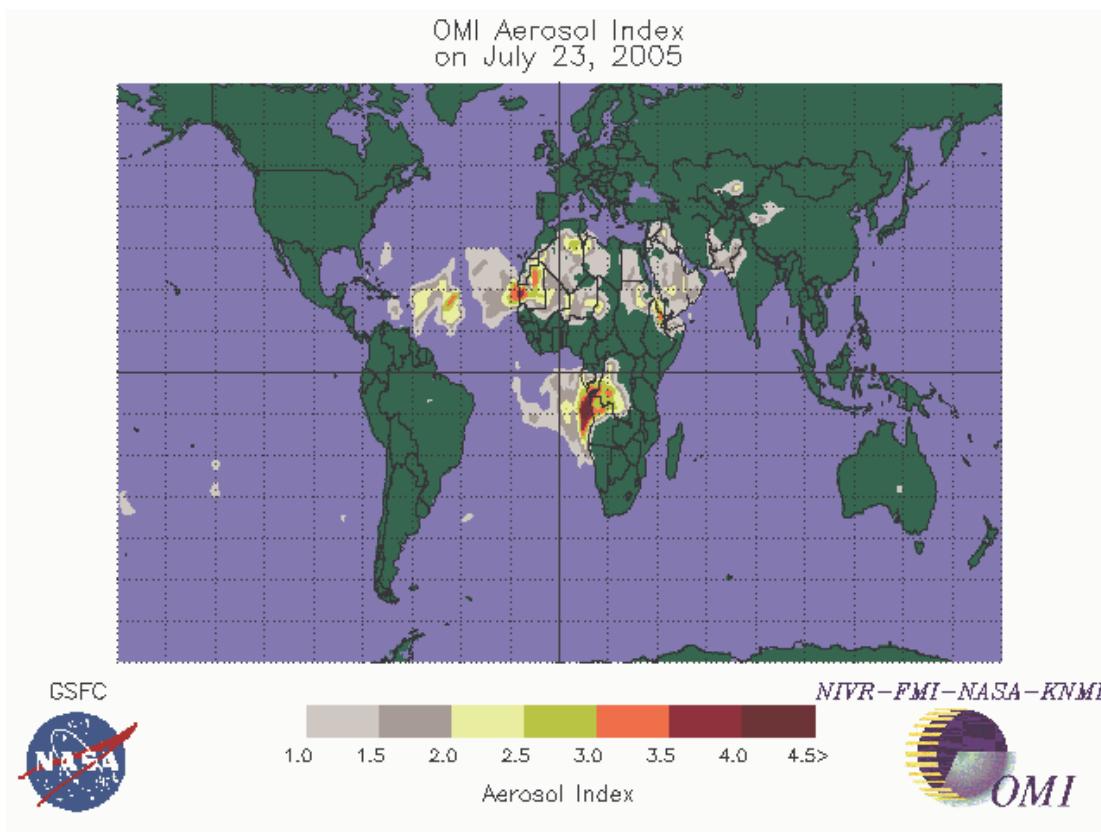


OMI Aerosol Products Preliminary Evaluation

**Omar Torres, Marcos Andrade
JCET, University of Maryland Baltimore County**

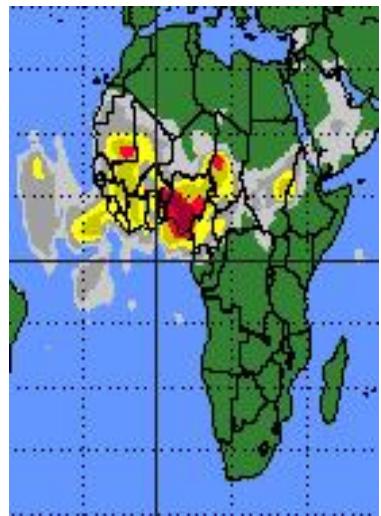
Omar Torres, Marcos Andrade
JCET, University of Maryland Baltimore County

OMI Aerosol Index



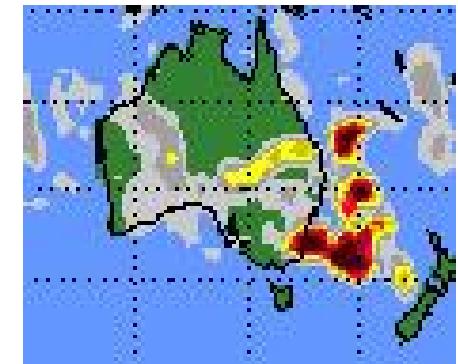
- By-product of Total Ozone Algorithm (OMTO3)
- Uses 337 and 360nm (extends the 20-year TOMS record)
- Sensitive to mineral dust and elevated carbonaceous aerosols
- Detects UV-absorbing aerosols over ice, snow, clouds

Aerosol Type Selection

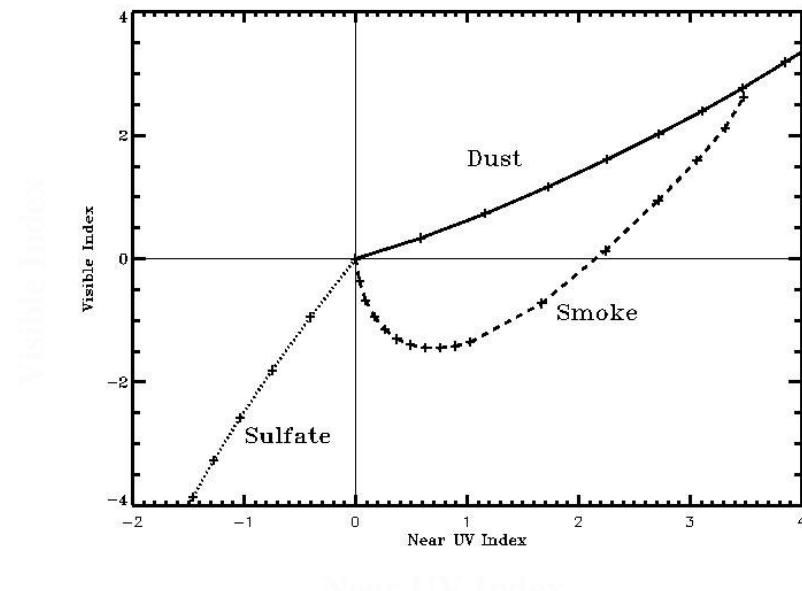
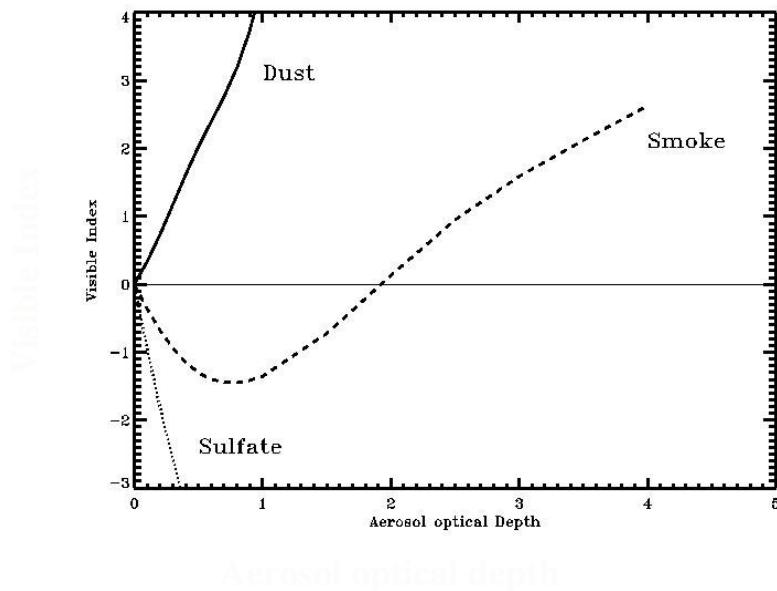


Near UV observations separate absorbing aerosols (smoke, mineral dust, volcanic ash) from other non-absorbing aerosol types.

Near UV observations only cannot be used to differentiate between absorbing aerosol types.

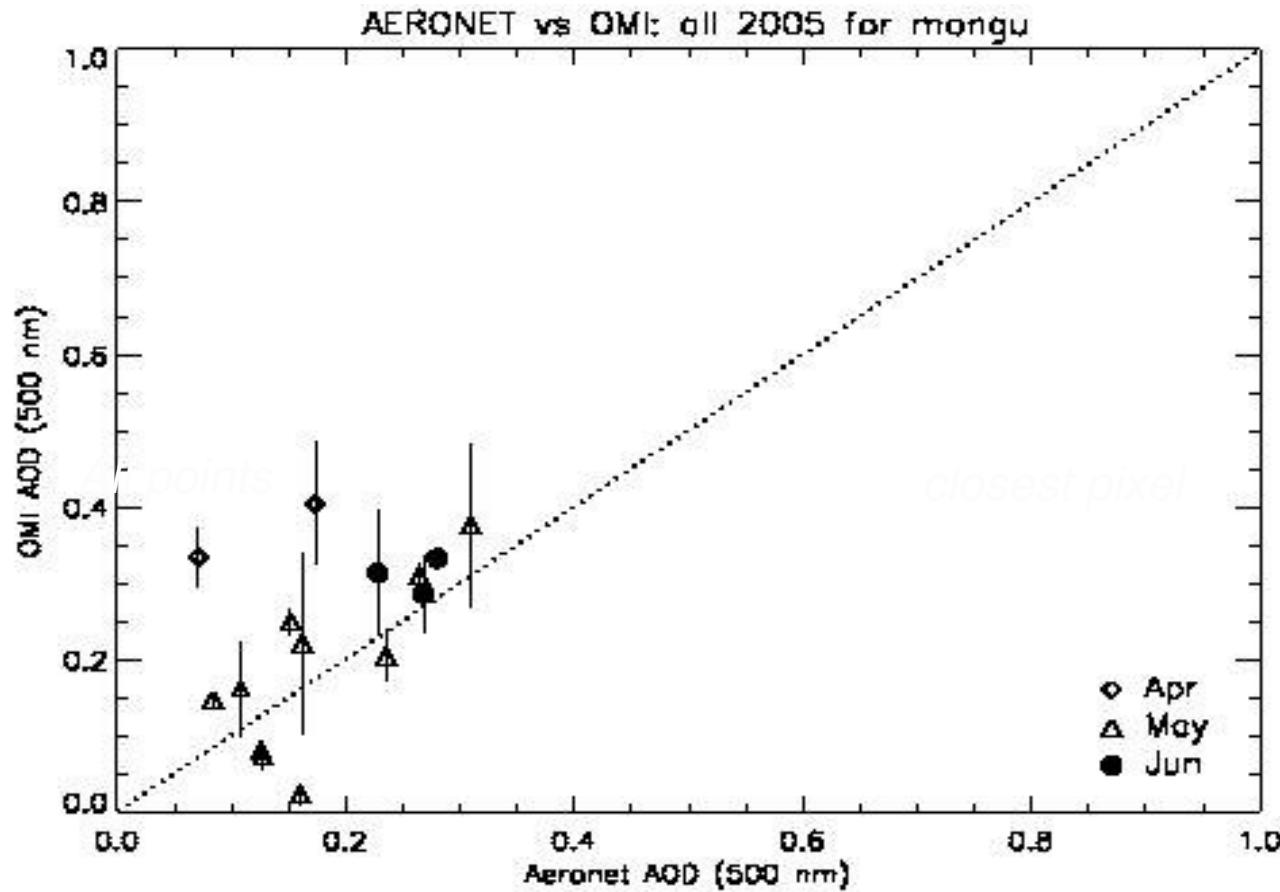


Combined use of UV and visible observations for aerosol type identification



Aerosol Optical Depth Validation

**OMI
AOD**



Aeronet, AOD

Mongu, Africa

Average

Average and reduced reflectivity



Comparison of OMI Cloud Pressures Derived from Rotational Raman Scattering with Collocated MODIS Data

Alexander Vasilkov¹ and Joanna
Joiner²

¹Science Systems and Applications, Inc.

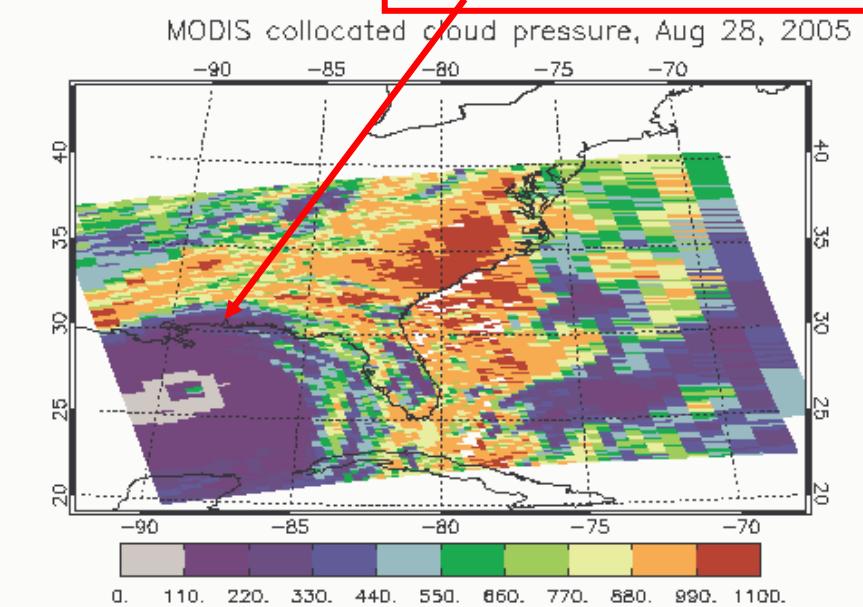
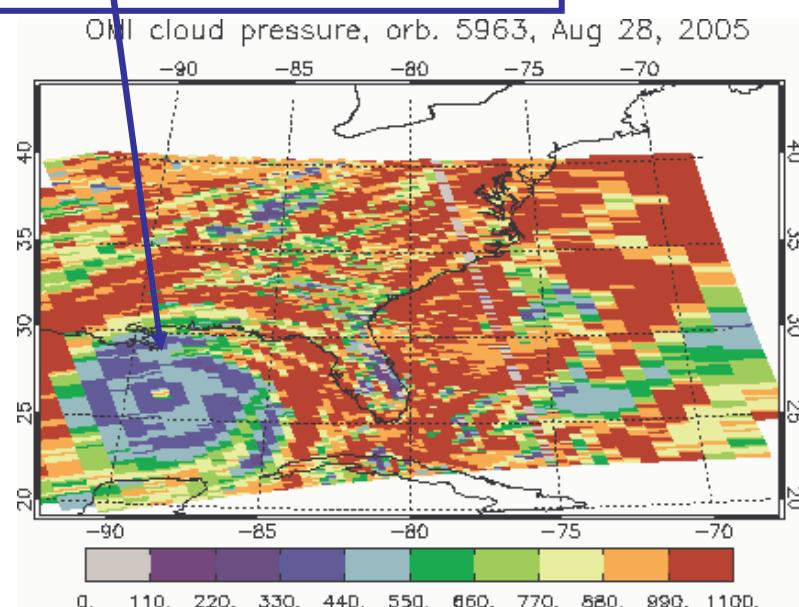
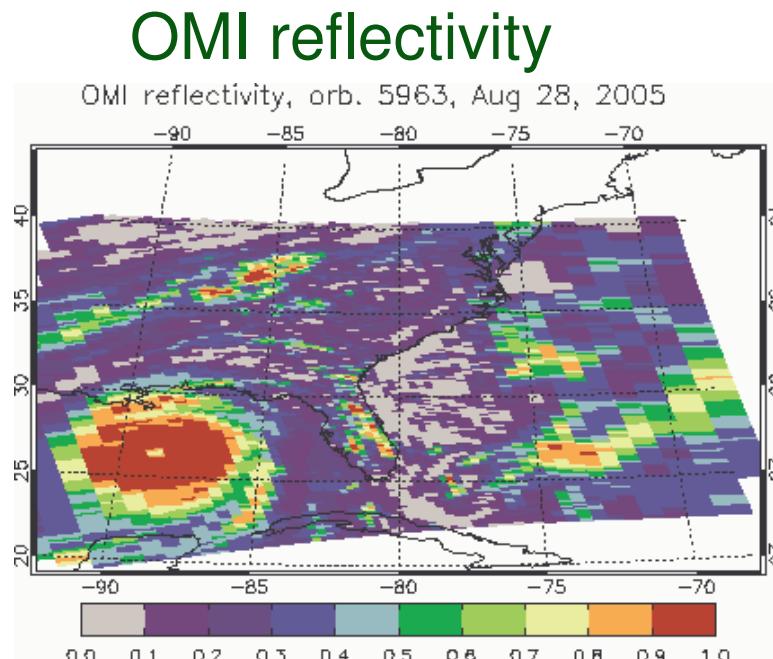
²NASA/Goddard Space Flight Center

Algorithm Basics

**Effective (“scattering”) cloud pressure derived from fitting
the high-frequency structure caused by filling-in of solar
Fraunhofer lines due to rotational Raman scattering (RRS)
in the atmosphere**

OMI's view of Katrina

OMI effective cloud pressure:
UV channels sensitive to Raman scattering see through high cirrus to lower water clouds with band structure



MODIS collocated cloud top pressure: Infrared channels primarily see highest cirrus clouds

Validating AURA OMI tropospheric SO₂ Data with aircraft in-situ measurements

**N. Krotkov, A. Krueger , S. Carn, R. Dickerson ,
J. Stehr, J. Hains, L. Marufu, C. Li and Z. Li**



UMBC

GEST
Goddard Earth Sciences and Technology Center

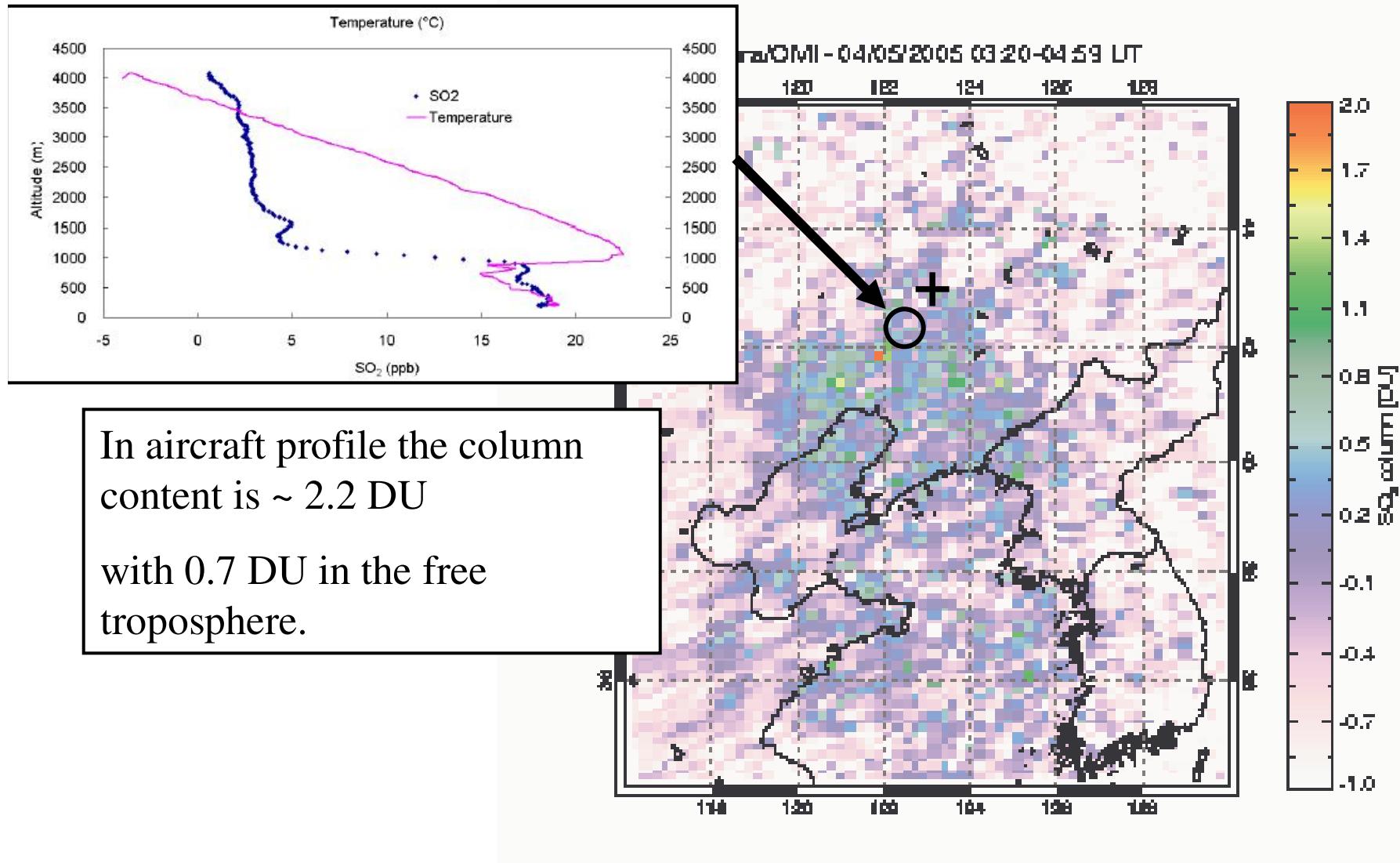


JCET

Above: a scientist from UMD (Jeff Stehr) with a Chinese pilot before an air-borne experiment in northeast China.



Comparisons South of Shenyang, April 5 2005



Stated Validation Needs

MLS – cloud and SO₂ observations
ice particle size distributions
SO₂ profiles after volcanic eruption

OMI – aerosol and SO₂
aerosol absorptive characteristics
validate aerosol / cloud situations
low altitude aircraft (e.g. SO₂ profiles)

HIRDLS – aerosol and cloud observations
validation of multi-wavelength
extinction composition determinations

TES – work with OMI team and ARM sites
to better define cloud top heights